

CLAIMS

1. A process for fabricating a thin-film magnetic head having an air bearing surface (ABS), the method comprising the unordered steps of:

- (a) polishing the surface of a first side of a monolithic substrate wafer;
- 5 (b) forming on the surface of the first side of the monolithic substrate wafer a first array of magnetic read head structures and magnetic write head structures each having a head gap;
- (c) polishing the surface of the other side of the monolithic substrate wafer;
- 10 (d) forming on the surface of the other side of the monolithic substrate wafer a second array of magnetic read head structures and magnetic write head structures disposed such that a plurality of the magnetic read head gaps on one of the monolithic substrate surfaces are each aligned to form a read/write track-pair with a corresponding one of the magnetic write head gaps on the other monolithic substrate surface;
- 15 (e) cutting the monolithic substrate to expose the head gaps of a plurality of read/write track-pairs; and
- (f) lapping the ABS to refine the depth of the exposed head gaps.

2. The method of claim 1 wherein the first and second arrays comprise:
a plurality of magnetic read and write head structures disposed such that each
20 read head structure is covered by a collocated write head structure in a piggy-back configuration.

3. The method of claim 2 wherein each of the magnetic read heads includes a magnetoresistive (MR) sensor element.

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4. The method of claim 1 further comprising the step of:
(h) cutting the monolithic substrate to separate therefrom a thin-film magnetic head having a single read/write track-pair.

5. The method of claim 4 wherein each of the magnetic read heads includes a magnetoresistive (MR) sensor element.

6. The method of claim 1 wherein the first array comprises a plurality of 5 magnetic read head structures adjoining one another and the second array comprises a plurality of magnetic write head structures adjoining one another.

7. The method of claim 1 wherein each of the magnetic read heads includes a magnetoresistive (MR) sensor element.

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8. A thin-film magnetic tape head having an air bearing surface (ABS), the head comprising:

a monolithic substrate layer having two sides;
a plurality of thin-film read head structures and thin-film write head structures 15 disposed on a first side of the monolithic substrate layer, each having a head gap disposed at the ABS; and
a plurality of thin-film read head structures and thin-film write head structures disposed on a second side of the monolithic substrate layer, each having a head gap disposed at the ABS and aligned such that a plurality of read head gaps on one of the 20 monolithic substrate surfaces are each aligned to form a read/write track-pair with a corresponding one of write head gaps on the other monolithic substrate surface.

9. The magnetic head of claim 8 wherein the pluralities of thin-film read and write structures are such that each read head structure is covered by a collocated write 25 head structure in a piggy-back configuration.

10. The method of claim 9 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

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11. The magnetic head of claim 8 wherein the pluralities of thin-film read and write structures are disposed in an alternating pattern such that each non-edge read head structure adjoins at least two write head structures.

5 12. The method of claim 11 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

13. The method of claim 8 wherein each of the read head gaps includes a magnetoresistive (MR) sensor element.

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14. A magnetic tape drive comprising:
a magnetic recording medium having a recording surface;
a motor for moving the magnetic recording medium;
a thin-film magnetic tape head having an air bearing surface (ABS) and
15 including:
a monolithic substrate layer having two sides;
a plurality of thin-film read head structures and thin-film write head structures disposed on a first side of the monolithic substrate layer, each having a head gap disposed at the ABS; and
20 a plurality of thin-film read head structures and thin-film write head structures disposed on a second side of the monolithic substrate layer, each having a head gap disposed at the ABS and aligned such that a plurality of the read head gaps on one of the monolithic substrate surfaces are each aligned to form a read/write track-pair with a corresponding one of the write head gaps on the other monolithic substrate surface; and
25 a head-mount assembly for supporting the magnetic tape head with respect to the magnetic recording medium.

15. The magnetic tape drive of claim 14 wherein the pluralities of thin-film
30 read and write structures are such that each read head structure is covered by a collocated

write head structure in a piggy-back configuration.

16. The method of claim 15 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

5 17. The magnetic head of claim 14 wherein the pluralities of thin-film read and write structures are disposed in an alternating pattern such that each non-edge read head structure adjoins at least two write head structures.

10 18. The method of claim 17 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

19. The method of claim 14 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

15 20. A process for fabricating a thin-film magnetic head having an air bearing surface (ABS), the method comprising the unordered steps of:

- (a) polishing the surface of a front side of a monolithic substrate wafer;
- (b) forming on the surface of the front side of the monolithic substrate wafer an array of magnetic read head structures and magnetic write head structures each having a head gap;
- (c) sectioning the monolithic substrate wafer to form a plurality of wafer subsections each having a back surface;
- (d) fixing the back surfaces of a pair of the wafer subsections to one another disposed such that a plurality of the magnetic read head gaps on the front surface of one of the wafer subsections are each aligned to form a read/write track-pair with a corresponding one of the magnetic write head gaps on the front surface of the other wafer subsection;
- (e) cutting the fixed pair of wafer subsections to expose the head gaps of a plurality of read/write track-pairs; and
- (f) lapping the ABS to refine the depth of the exposed head gaps.

21. The method of claim 20 wherein the first and second arrays comprise:
a plurality of magnetic read and write head structures disposed such that each
read head structure is covered by a collocated write head structure in a piggy-back
5 configuration.

22. The method of claim 21 wherein each of the magnetic read heads includes
a magnetoresistive (MR) sensor element.

10 23. The method of claim 20 further comprising the step of:
(h) cutting the fixed pair of wafer subsections to separate therefrom a thin-film magnetic head having a single read/write track-pair.

15 24. The method of claim 23 wherein each of the magnetic read heads includes
a magnetoresistive (MR) sensor element.

25. The method of claim 20 wherein the array comprises a plurality of
magnetic read head structures adjoining one another.

20 26. The method of claim 20 wherein each of the magnetic read heads includes
a magnetoresistive (MR) sensor element.

25 27. A thin-film magnetic tape head having an air bearing surface (ABS), the
head comprising:

a pair of wafer subsections each having front and back sides wherein the two back
surfaces are fixed to one another;

a plurality of thin-film read head structures and thin-film write head structures
disposed on the front surface of one of the wafer subsections, each having a head gap
disposed at the ABS; and

5 a plurality of thin-film read head structures and thin-film write head structures disposed on the front surface of the other wafer subsection, each having a head gap disposed at the ABS and aligned such that a plurality of read head gaps on one of the wafer subsections are each aligned to form a read/write track-pair with a corresponding one of write head gaps on the other wafer subsection.

10 28. The magnetic head of claim 27 wherein the pluralities of thin-film read and write structures are such that each read head structure is covered by a collocated write head structure in a piggy-back configuration.

15 29. The method of claim 28 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

30. The magnetic head of claim 27 wherein the pluralities of thin-film read and write structures are disposed in an alternating pattern such that each non-edge read head structure adjoins at least two write head structures.

20 31. The method of claim 30 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

32. The method of claim 27 wherein each of the read head gaps includes a magnetoresistive (MR) sensor element.

25 33. A magnetic tape drive comprising:
a magnetic recording medium having a recording surface;
a motor for moving the magnetic recording medium;
a thin-film magnetic tape head having an air bearing surface (ABS) and including:
30 a pair of wafer subsections each having front and back sides wherein the

two back surfaces are fixed to one another;

5 a plurality of thin-film read head structures and thin-film write head structures disposed on the front surface of one of the wafer subsections, each having a head gap disposed at the ABS; and

10 a plurality of thin-film read head structures and thin-film write head structures disposed on the front surface of the other wafer subsection, each having a head gap disposed at the ABS and aligned such that a plurality of read head gaps on one of the wafer subsections are each aligned to form a read/write track-pair with a corresponding one of write head gaps on the other wafer subsection; and

a head-mount assembly for supporting the magnetic tape head with respect to the magnetic recording medium.

15 **34.** The magnetic tape drive of claim 33 wherein the pluralities of thin-film read and write structures are such that each read head structure is covered by a collocated write head structure in a piggy-back configuration.

20 **35.** The method of claim 34 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

25 **36.** The magnetic head of claim 33 wherein the pluralities of thin-film read and write structures are disposed in an alternating pattern such that each non-edge read head structure adjoins at least two write head structures.

37. The method of claim 36 wherein each of the read heads includes a magnetoresistive (MR) sensor element.

30 **38.** The method of claim 33 wherein each of the read heads includes a magnetoresistive (MR) sensor element.